Detection & Selection of Skin and Skin like Background under Complex Background

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Abstract: ***Skin detection is the process of finding skin colored pixels and regions in an image or a video. Skin detection plays an important role in a wide range of image processing applications ranging from face detection, face tracking, gesture analysis, and content-based image retrieval systems and to various human computer interaction domains. Skin color has proven to be a useful and robust cue for face detection, localization and tracking. During skin detection some non-skin pixels are usually detected as skin pixels. It is very difficult in images to select skin areas with complex background. The purposed work is an improved skin detection method that uses color spaces and combines color spaces to detect skin areas. The experimental result can separate skin and non-skin color under complex background.***

Keywords: skin detection, color spaces, skin pixel, skin color, images.

1. Introduction

Skin detection is the important component of variety of image processing applications related with the people, and it aims to detect human skin region in the image. Skin detection contains computer vision, pattern recognition, artificial intelligence, image processing and other areas of research content and other various fields. A skin detector typically transforms a given pixel into an appropriate color space and then uses a skin classifier to label the pixel whether it is a skin or a non-skin pixel. Skin detection process has two phases: a training phase and a detection phase. Training a skin detector involves three basic steps:

1. Collecting a database of skin patches from different images. Such a database typically contains skin colour patches from a variety of people under different illumination conditions.
2. Choosing a suitable colour space.
3. Learning the parameters of a skin classifier.

Given a trained skin detector, identifying skin pixels in a given image or video frame involves:

1. Converting the image into the same color space that was used in the training phase.
2. Classifying each pixel using the skin classifier to either a skin or non-skin.
3. Typically post processing is needed using morphology to impose spatial homogeneity on the detected regions.

Standard skin color detection techniques are affected by changing lighting conditions, complex backgrounds and surfaces having skin like colors. The traditional skin detection algorithm which based on various kinds of color space can distinguish the color information and non-color information very well, but they are often difficult to detect the information that similar with the color information. Skin color and textures are important cues that people use consciously or unconsciously to infer variety of culture-related aspects about each other. Skin detection means detecting image pixels and regions that contain skin-tone color. Verities of color space are used for skin detection and color segmentation, such as RGB, YCgCb, YUV, and HSV. Color space also called color model or color system, and its purpose is to illustrate the color in some standard with usually acceptable way [6].On combining local information of the picture with skin color models to achieve better detection performances in dealing with pictures with more complexity background [2]. Experiment results show that our approach can separate skin area from skin-like background

2. Overview of Our Approach

This paper first reads the image and captures the dimensions of that image .After that converting the original image from RGB color space to YCgCb color space to detect the images. The flow chart of skin detection is shown in figure 1.

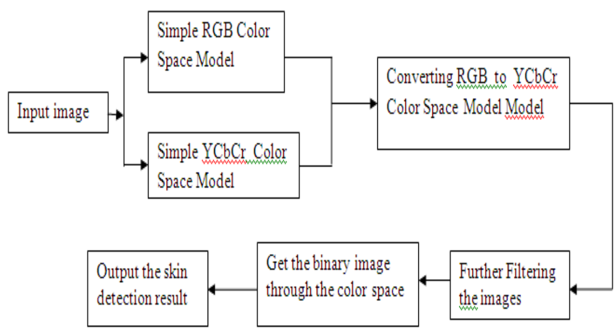


Figure 1: The flow chart of skin detection

3. Color Spaces

A color space is a method by which we can specify, create and visualize color. A color space is mathematical representation of a set of colors. The most popular models are RGB (used in computer graphics) YIQ, YUV, YCbCr (used in video systems).

A. RGB Color Space

The red, green and blue (RGB) color space is widely used throughout computer graphics. Red, green and blue are three primary additive colors and are represented by a three dimensional, Cartesian coordinate system. The indicated diagonal of the cube, with equal amounts of each primary component, represent various gray levels. This is the most prevalent choice for computer graphics.

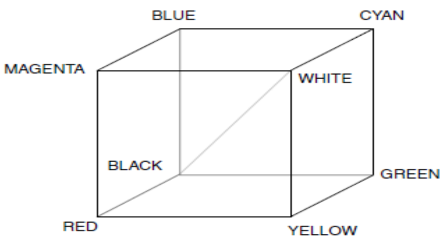


Figure 2: RGB Color Space

B. YCgCb Color Space

YCbCr is scaled and offset version of the YUV color space. Y is defined to have a nominal 8-bit range of 16-235; Cb and Cr are defined to have a nominal range of 16-240.

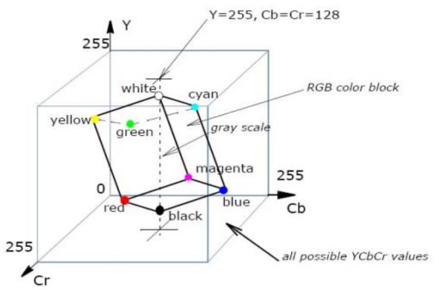


Figure 3: YCgCb Color Space

C. GLCM

The Gray-level co-occurrence matrix (GLCM) also called as the Gray Tone Spatial Dependency Matrix. The GLSM is a tabulation of how often different combinations of pixel brightness values (gray levels) occur in an image. In image processing, too many gray levels will increase the co-occurrence matrix computation and reduce the retrieval speed. The Gray-level co-occurrence matrix is used to extract texture features. A statistical method of examining texture that considers the spatial relationship of pixels is the gray-level co-occurrence matrix (GLCM), also known as the gray-level spatial dependence matrix. The GLCM functions characterize the texture of an image by calculating how often pairs of pixel with specific values and in a specified spatial relationship occur in an image, creating a GLCM, and then extracting statistical measures from this matrix.

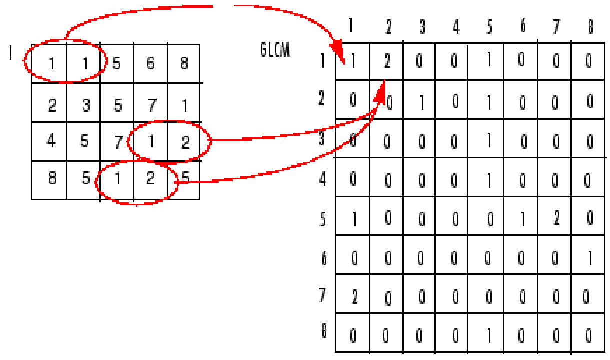


Figure 4: Gray-level co-occurrence matrix

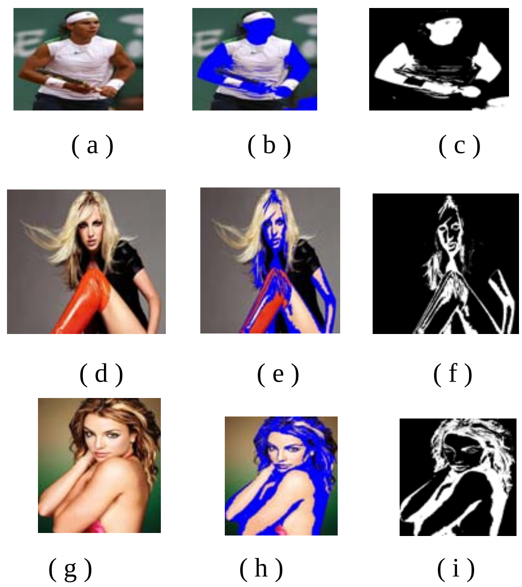
D. Skin Model

Skin model is a variety of color space, one of the common models is YCbCr color space. Here Y represents luminance component, Cb represents blue component, Cr represents red component. In this space, skin color clusters well. In RGB color space, color is defined as red, green and lue, each color is corresponding to the three kinds of color components. That is red component Cr, blue components Cb and green component Cg. RGB values are transformed into YCbCr values as follows:

$$\begin{bmatrix} Y \\ Cb \\ Cr \end{bmatrix} = \begin{bmatrix} 16 \\ 128 \\ 128 \end{bmatrix} + \begin{bmatrix} 65.481 & 128.533 & 24.966 \\ -37.797 & -74.203 & 112.000 \\ 112.000 & -93.786 & -18.214 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

4. Experimental Results

In this section the experimental results obtained on a number of images are shown.



(j) (k) (l)

Figure 5: (a)(d)(g)(j) Original images, (b)(e)(h)(k) Converted images.(c)(f)(i)(l) Result images

In figure 5, (a) (d) (g) (j) are the original images. (b) (e) (h) (k) are the converted images. (c) (f) (i) (l) are the results images.

5. Conclusions

In this paper, we use simple RGB color space, YCgCb color space for skin detection.RGB color space converted into the YCgCb color space. After filtering detect skin areas of the original image. Experimental results show that this method can remove a large number of non-skin colors under the complex background, which enhanced the resolution between skin color and non-skin color. The experimental results still have some mistakes; the further work is to improve the resolution by finding a better way on the basis of this method.

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